What is the relationship between portion size and body weight in adults?

Conclusion

Strong evidence documents a positive relationship between portion size and body weight.

Grade: Strong

Overall strength of the available supporting evidence: Strong; Moderate; Limited; Expert Opinion Only; Grade not assignable For additional information regarding how to interpret grades, click here.

Evidence Summary Overview

The 2005 DGAC reviewed the evidence related to the effect of portion size (the amount of food served in one eating occasion) on energy intake, concluding that portion size influences how much a person eats; and, in general, more calories are consumed when a large portion is served rather than a small one (HHS/USDA, 2005). For this reason, we did not conduct an NEL review on the evidence related to portion size and energy intake. However, a NEL literature review on the effects of portion size on body weight was done and four studies were identified: Three randomized controlled trials (RCTs) (Gilhooly, 2007; Hannum, 2006; Hannum, 2004) and one case-control study (Pearcey, 2002). The studies were conducted in the US. Studies ranged in sample size from 19 (Pearcey, 2002) to 53 (Hannum, 2004) and one study included only men (Hannum, 2006), two studies included only women (Gilhooley, 2007; Hannum, 2004), and one study included both men and women (Pearcey, 2002). The three RCTs focused on controlling portion sizes to aid in weight loss and all found a positive relationship between controlling portion size and weight loss in adults. The small case-controlled study of Pearcey et al, (2002) followed weight stable and weight gaining adults and found that consuming larger portion sizes was positively associated with weight gain.

Evidence summary paragraphs:

Randomized Controlled Trials (3)

Gilhooly C et al, 2007 (positive quality) conducted an RCT in which they examined characteristics of craved foods in relation to dietary energy restriction and weight. Assessments of food cravings were done before and during a randomized trial of high- and low-glycemic diets followed over a six-month period. Subjects self-reported food cravings and portion size of craved foods was determined using a seven-day food record. The final sample included 32 women (mean age=35±5 years; mean BMI=27.8±1.4kg/m^2), with all 32 subjects enrolled completely the six-month trial. Results showed that there was a significant positive relationship between reported portion size of craved food consumed at baseline and lifetime high BMI (r=0.49, P=0.005). Regression analyses showed that subjects who lost a greater percentage of weight reported giving in to food cravings less frequently (adjusted R2=0.31, P=0.009). The authors concluded that portion size and frequency of giving in to food cravings are important focus areas for long-term weight loss.

Hannum S et al, 2006 (positive quality) conducted an RCT to test the effects on weight loss of using packaged portion-controlled entrees compared to a self-selected diet in men. The portion-control group consumed two portion-controlled entrees daily, and the self-select group

consumed a diet based on the Food Guide Pyramid for a period of eight weeks; both diets were designed to be isocaloric and identical in macronutrient content. Subjects completed three-day food records every two weeks to assess dietary intake and compliance, and weight was measured at baseline and eight weeks. The final sample included 51 men (mean age=38 years; mean BMI=31kg/m^2). Attrition rate was 15% over the eight-week intervention. The portion-control group experienced greater decreases in weight (-7.4±3.1 vs. -5.1±4.0kg), BMI (-2.4±1.0 vs. -1.6±1.3kg/m^2), and fat mass (-3.6±1.8 vs. -2.5±1.8kg) compared to the self-selection group (P<0.05). The authors concluded that achieving portion control through the use of prepackaged food products was an effective means of enhancing weight loss in men.

Hannum S et al, 2004 (positive quality) conducted an RCT to test the effects on weight loss of using packaged portion-controlled entrees compared to a self-selected diet in women. The portion-control group consumed two portion-controlled entrees daily, and the self-select group consumed a diet based on the Food Guide Pyramid for a period of eight weeks; both diets were designed to be isocaloric and identical in macronutrient content. Subjects completed three-day food records every two weeks to assess dietary intake and compliance, and weight was measured at baseline and eight weeks. The final sample included 53 women (mean age=37 years; mean BMI=31kg/m^2). Attrition rate was 12% over the eight-week intervention. The portion-control group experienced greater decreases in weight (-5.6±2.2 vs. -3.6±2.5kg) and fat mass (-3.6±1.8 vs. -2.3±1.4kg) compared to the self-selection group (P<0.05). The authors concluded that achieving portion control through the use of pre-packaged food products was an effective means of enhancing weight loss in women.

Case-Control Studies (1)

Pearcey S et al, 2002 (positive quality) conducted a case-control study to examine food intake patterns of weight-gaining and weight-stable persons in order to better understand dietary patterns that contribute to weight gain and obesity. Subjects completed seven-day food records, in which they records their activity levels, everything that ate or drank, and the environmental and psychological factors surrounding each eating episode for seven consecutive days. The final sample included 19 subjects (12 women, seven men; mean age=25 years; mean BMI=30kg/m^2 for women and 27kg/m^2 for men). The weight-gaining group consumed 1,654kJ more calories than the weight-stable group (P<0.05), which was due to the weight-gaining group consuming significantly larger meal sizes than the weight-stable group (2,854.52±162.80 vs. 2,546.87±113.61kJ per meal; P<0.05). The authors concluded that consuming larger size meals was positively associated with weight gain.

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Author, Year, Study Design, Class, Rating	Participants/Location	Methods: Diet Assessment, Adiposity Measurement	Outcomes
Gilhooly et al 2007 Study Design: Randomized trial	N=32 women (mean age=35±5 years; mean BMI=27.8±1.4kg/m^2). Location: United States.	Assessments of food cravings were done before and during a randomized trial of high- and low-glycemic diets followed over a six month	Results showed that there was a significant positive relationship between reported portion size of craved food consumed at baseline and lifetime

Class: A Rating:		period. Subjects self-reported food cravings and portion size of craved foods was determined using a seven-day food record.	high BMI (r=0.49, P=0.005). Regression analyses showed that subjects who lost a greater percentage of weight reported giving in to food cravings less frequently (adjusted R2=0.31, P=0.009).
Hannum et al 2006 Study Design: Randomized trial Class: A Rating:	N=51 men (mean age=38 years; mean BMI=31kg/m^2). Attrition rate was 15% over the eight-week intervention. Location: United States.	The portion-control group consumed two portion-controlled entrees daily and the self-select group consumed a diet based on the Food Guide Pyramid for a period of eight weeks; both diets were designed to be isocaloric and identical in macronutrient content. Subjects completed three-day food records every two weeks to assess dietary intake and compliance, and weight was measured at baseline and eight weeks.	The portion-control group experienced greater ↓ in weight (-7.4±3.1 vs. -5.1±4.0kg), BMI (-2.4±1.0 vs. -1.6±1.3kg/m^2), and fat mass (-3.6±1.8 vs. -2.5±1.8kg) compared to the self-selection group (P<0.05).
Hannum SM et al 2004 Study Design: Randomized Controlled Trial Class: A Rating:	N=53 women (mean age=37 years; mean BMI=31kg/m^2). Attrition rate was 12% over the eight-week intervention. Location: United States.	The portion-control group consumed two portion-controlled entrees daily, and the self-select group consumed a diet based on the Food Guide Pyramid for a period of eight weeks; both diets were designed to be isocaloric and identical in macronutrient content. Subjects completed three-day food records every two weeks to assess dietary intake and	The portion-control group experienced greater ↓ in weight (-5.6±2.2 vs. -3.6±2.5kg) and fat mass (-3.6±1.8 vs. -2.3±1.4kg), compared to the self-selection group (P<0.05).

		compliance, and weight was measured at baseline and eight weeks.	
Pearcey and Castro 2002 Study Design: Case-control study Class: C Rating: 	N=19 subjects (12 women, seven men; mean age=25 years; mean BMI=30kg/m^2 for women and 27kg/m^2 for men). Location: United States.	Subjects completed seven-day food records, in which they records their activity levels, everything that ate or drank and the environmental and psychological factors surrounding each eating episode for seven consecutive days.	The weight-gaining group consumed 1,654kJ more calories than the weight-stable group ($P<0.05$), which was due to the weight-gaining group consuming significantly larger meal sizes than the weight-stable group (2,854.52±162.80 vs. 2,546.87±113.61kJ per meal; $P<0.05$).

Research Design and Implementation Rating Summary
For a summary of the Research Design and Implementation Rating results, click here.

Worksheets

Gilhooly CH, Das SK, Golden JK, McCrory MA, Dallal GE, Saltzman E, Kramer FM, Roberts SB. Food cravings and energy regulation: the characteristics of craved foods and their relationship with eating behaviors and weight change during 6 months of dietary energy restriction. *Int J Obes* (Lond). 2007 Dec;31(12):1849-58.

Hannum SM, Carson LA, Evand Em, Petr EL, Wharton CM, Bui L, Erdman JW. Use of packaged entrees as part of a weight-loss diet in overweight men: an 8-week reandomized clinical trial. Diabetes Obes Metab 2006 (2):146-156.

Hannum SM, Carson LA, Evans EM, Canene KA, Petr EL, Bui L, Erdman JW. Use of portion-controlled entrees enhances weight loss in women. Obes Res 2004; 12: 538-546.

Pearcey SM, de Castro JM. Food intake and meal patterns of weight-stable and weight-gaining persons. *Am J Clin Nutr.* 2002;76(1):107-112.